PB-237 696

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: COAL PREPARATION PLANTS, VOLUME 2. SUMMARY AND TEST DATA

Environmental Protection Agency
Research Triangle Park, North Carolina

October 1974

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1. REPORT NO. EPA-450/2-74-021b	2.
3.	PB 237 696
4. TITLE AND SUBTITLE: Background Information for Standards of Performance: Coal Preparation Plants, Volume 2, Summary of Test Data	5. REPORT DATE: October 1974
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This volume is the first of a series on standards of performance for coal preparation plants. This volume presents the proposed standards and the rationale for the degree of control selected. The volume also discusses the analytical methods for sampling emissions and the environmental and economic impact of the standards.

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INFORMATION SERVICE
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KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Pollution control Performance standards Coal Preparation Plants	Air pollution control	

18. DISTRIBUTION STATEMENT: Unlimited	19. SECURITY CLASS *(This Report)*: Unclassified	21. NO. OF PAGES: 39
	20. SECURITY CLASS *(This page)*: Unclassified	22. PRICE: 3.75-2.25

Form 2220-1 (9-73)

EPA-450/2-74-021b

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: COAL PREPARATION PLANTS VOLUME 2: TEST DATA SUMMARY

Emission Standards and Engineering Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

October 1974

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Publication No. EPA-450/2-74-021b

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COAL PREPARATION PLANTS

SUMMARY OF TEST DATA

INTRODUCTION

This document presents a summary of source tests and visible emission measurements cited in Background Information for Standards of Performance: Coal Preparation Plants, Volume 1, Proposed Standards. This volume is principally a summary of test results for particulate matter, but also describes the facilities, their operating conditions, and characteristics of exhaust gas streams.

Facilities are identified by the same coding used in Volume 1. For example, Table 1 summarizes results of the January 1972 tests of emissions from an air table, Facility A. These same results are also plotted in Figure 9 of Volume 1.

Many of the tests summarized herein were conducted using EPA Reference Method 5 for particulate matter (with minor variations in some cases).[1/] When this method was used, additional measurements were made to evaluate materials that condense and collect in the impingers as the gases are cooled. In the summaries, the "probe and filter catch" is the particulate emission measurement that was presented in Volume 1 and is the basis for the standard. The "total catch" includes the probe and filter catch plus material collected in the impingers.

Some tests summarized herein were conducted using methods which do not use impingers. Particulate matter was collected on an alundum thimble or a

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1/ Environmental Protection Agency, "Standards of Performance for New Stationary Sources," Federal Register, 36 (247): 24888-24890, December 1971.

fiberglass filter. In these test methods, the filter or thimble particulate catch is analogous to the "probe and filter catch" of Method 5.

Particulate Test Results

A test program was undertaken by EPA to evaluate the best particulate emission control systems available for installation on new or substantially modified air tables and thermal dryers in coal preparation plants. A total of five plants were tested, three thermal dryer facilities and two air table operations. All thermal dryers were controlled by venturi-type wet scrubbers, while all air tables were controlled by baghouse collectors. In addition, an EPA survey accumulated test data from which one air table test and four thermal dryer tests were chosen as reliable data.

Figures 1 and 2 plot emission rates in grains per DSCF versus the applicable coal preparation facility for air tables and thermal dryers, respectively.

Facilities

A. Air tables. Each air table within Plant A has a design capacity of 75 tons cleaned coal per hour, is equipped with a cyclone and a closed suction-type, cyclic cleaned baghouse of polypropylene fabric. The coal processed was a mixture of lower Kittanning and Upper Freeport seams with a Hardgrove grindability index of approximately 90. Feed analysis showed 28 mesh x 0 material at 19.69 percent of total feed. The plant was operating at 70 tons per hour cleaned coal during tests. There were no visible emissions from stack. Tests were conducted using EPA Method 5 except that sampling was conducted in a tangential gas flow.

B_1. Air tables. Each air table within Plant B has a design capacity of 50 tons cleaned coal per hour, is equipped with a cyclone and a closed suction-type, cyclic cleaned baghouse of nylon fabric. The coal processed was from the Pocahontas seam with a Hardgrove grindability index of 100. Feed analysis showed 28 mesh x 0 material at 36.0 percent of total feed. The plant was operating at 38 tons cleaned coal per hour. No visible emissions were observed from the stack. Tests were conducted using EPA Method 5 except sampling was conducted in a tangential gas flow.

B_2. Same facility as B_1, but tests were conducted privately under contract to the company. The coal being processed, feed analysis, and production rate during these tests are not known. Tests were conducted using an alundum thimble inside the stack. Sampling was done in a tangential gas flow.

C_1. Fluid-bed thermal dryer. The dryer design capacity is 408.5 tons per hour coal feed and 40 tons per hour evaporation. Filter cake (-28 mesh) at 35 percent of plant output is fed to the dryer with all 1/4 x 28 M product. The plant normally operates the dryer at 293 tons/hour coal feed. The dryer is controlled by multiclone bank precleaners and a venturi-type scrubber with a cyclonic mist eliminator. The stack had straightening vanes permanently installed. During the test, dryer feed was 300 tons/hour. Scrubber-mist eliminator pressure drop was 28 inches w.g. The coal processed was a mixture of Pochaontas No. 3 and No. 5 seams of 100+ Hardgrove grindability. Previous sieve analysis showed an average -325 mesh

feed content of 8 percent. Inlet grain loadings averaged 9.8 gr/DSCF. Plume aftertail showed 5-10 percent opacity. The test method was EPA Method 5.

C_2. Same facility as C_1, but the scrubber-mist eliminator pressure drop was 26.5 inches w.g. during this test. No visible emissions were noted during these tests.

D_1. Fluid-bed thermal dryer. The dryer design capacity is 385 tons per hour feed and 35-45 tons per hour evaporation. Filter cake (-28 mesh) at either 50 or 100 percent of plant output can be fed to the dryer with all 1/4 x 28M product. The plant normally operates the dryer at 325 tons/hour feed with 50 percent filter cake in the feed. The dryer is controlled by two cyclones in parallel followed by a venturi-type scrubber with a cyclonic mist eliminator. During tests dryer feed was 300 to 360 tons/hour with 100 percent of filter cake being dried. Scrubber ΔP was 35 inches w.g. The coal processed was Pocahontas No. 3 seam of 100+ grindability. Sieve analysis showed that 4.22 percent of the feed was less than 325 mesh. Inlet grain loadings averaged 1.58 grain/DSCF. Tests were conducted using EPA Method 5 except that sampling was conducted in a tangential gas flow. Plume opacity was less than 10 percent.

D_2. Same facility, plant operation, and test method as for D_1. Plume opacity was less than 10 percent.

D_3. Same facility and plant operation as for D_1 and D_2. Egg-crate type vanes were inserted into the stack to straighten the gas flow for comparison to the D_2 tests. EPA Method 5 was used. Plume opacity was less than 10 percent.

D_4. Same facility as D_1, D_2, and D_3. Only visible emission data (using EPA Method 9) was obtained.

E_1. Fluid-bed thermal dryer. The dryer design capacity is 274 tons per hour coal feed and 36 tons per hour evaporation. All filter cake passes through the dryer. Plant operation averaged 125 tons/hour feed to the dryer prior to the test. The dryer is controlled by a multiclone bank followed by a venturi-type scrubber with a cyclonic mist eliminator. During tests the dryer feed was 200 tons per hour and scrubber ΔP was 21 inches total. The coal processed was Taggart seam of 55 Hardgrove grindability and was dried to 2.5 percent surface moisture. Coal fed to the dryer was 5.0 percent less than 325 mesh. Plume aftertail was 5 to 10 percent opacity. Tests were conducted using EPA Method 5 except that sampling was conducted in a tangential gas flow.

E_2. Same facility, plant operation and test method as for E_1 except that Osaka seam coal, 55 Hardgrove grindability, was dried to 1.3 percent surface moisture. The coal fed to the dryer was still 5.0 percent less than 325 mesh. Plume aftertail ranged from 10 to 15 percent opacity.

F. Fluid-bed thermal dryer. The dryer design capacity is 400 tons per hour coal feed and 40 tons per hour evaporation. Thirty-five percent of the filter

cake is fed to the dryer. The plant operation averages 360 tons per hour dryer feed. The dryer is controlled by a multiclone bank followed by a venturi-type scrubber with a cyclonic mist eliminator (ΔP of 26 inches w.g.). The coal processed is No. 3 Pocahontas, 100+ Hardgrove grindability. No sieve analysis of feed is available. Process data during the test is limited. Tests were conducted privately using American Air Filter Method No. 139.[1/] Sampling was conducted with a fiberglass filter followed with a back-up filter. The probe tip was tilted to sample from the direction of maximum velocity. A measuring orifice was used instead of a dry test meter.

G. Fluid-bed thermal dryer. The dryer design capacity is 365 tons per hour coal feed and 37 tons per hour evaporation. Thirty-five percent of the filter cake is fed to the dryer. The plant operation is normally at rated capacity. The dryer is controlled by a multiclone bank followed by a venturi-type scrubber with a tray scrubber as a mist eliminator. Total ΔP is estimated at 25 inches w.g. The coal processed is No. 3 Pocahontas, Hardgrove grindability index 100. No sieve analysis of feed is available. Process data during the test is limited. The test method is the same as for B_2.

H. Fluid-bed thermal dryer. The dryer design capacity is 197 tons coal per hour feed and 22 tons per hour evaporation. The dryer operates at 210 tons coal per hour. All the filter cake goes through the dryer. The dryer is controlled by twin cyclones in parallel, followed by a venturi-type scrubber. Total

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[1/] American Air Filter Company, Incorporated, "Operating Instructions--Five Inch Dust Sampler and Thirteen Inch Dust Sampler," Report 139, May 16, 1956.

ΔP is 21.75 inches w. g. The coal processed is Beckley seam, Hardgrove grindability of 102. Sieve analysis of the dryer feed shows 0.59 percent is less than 325 mesh. Process data during the test is limited. Company personnel conducted the test using EPA Method 5 except that sampling was conducted in a tangential gas flow.

I. Fluid-bed thermal dryer. The dryer design capacity is 184 tons per hour feed and 14 tons per hour evaporation. The dryer operates at 100 tons per hour. All the filter cake is fed to the dryer. Emission controls consist of cyclone banks followed by a venturi-type scrubber. Coal processed is Pocahontas, 100+ Hardgrove grindability. Sieve analysis of the dryer feed shows 3.75 percent less than 100 mesh. Limited process data is available during the emission tests. The test method is the same as for F.

X. This facility is identical to that of facility D_1. Only visible emission data (using EPA Method 9) was obtained.

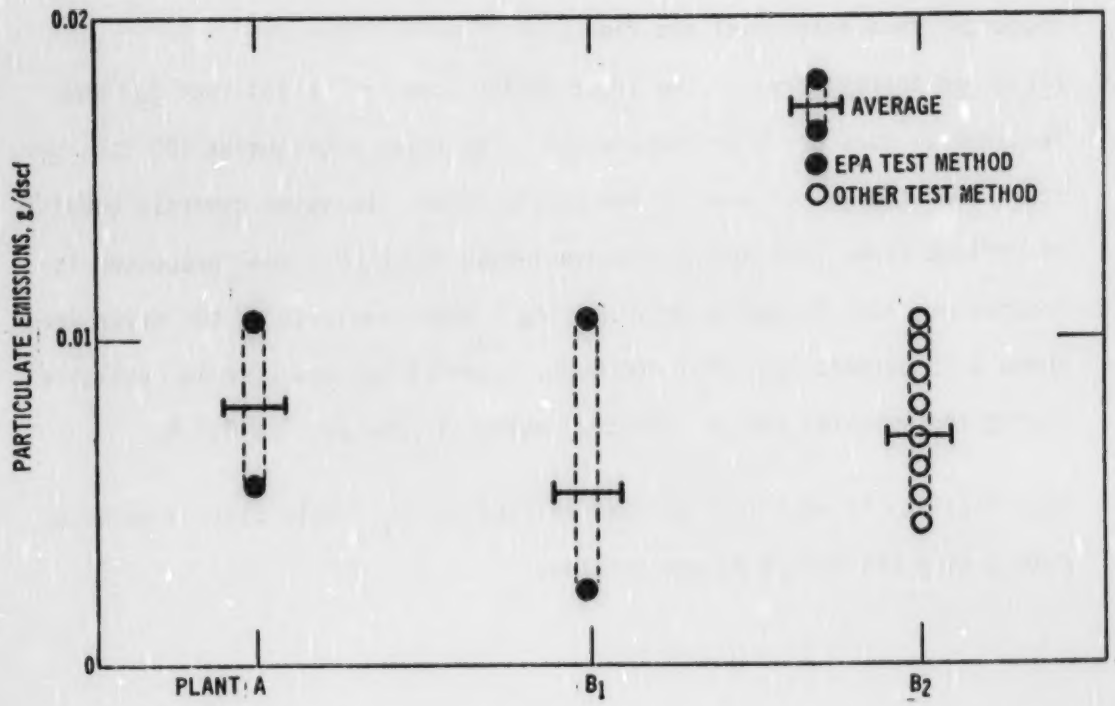

Figure 1. Particulate emissions from air table exhausts controlled by fabric filters.

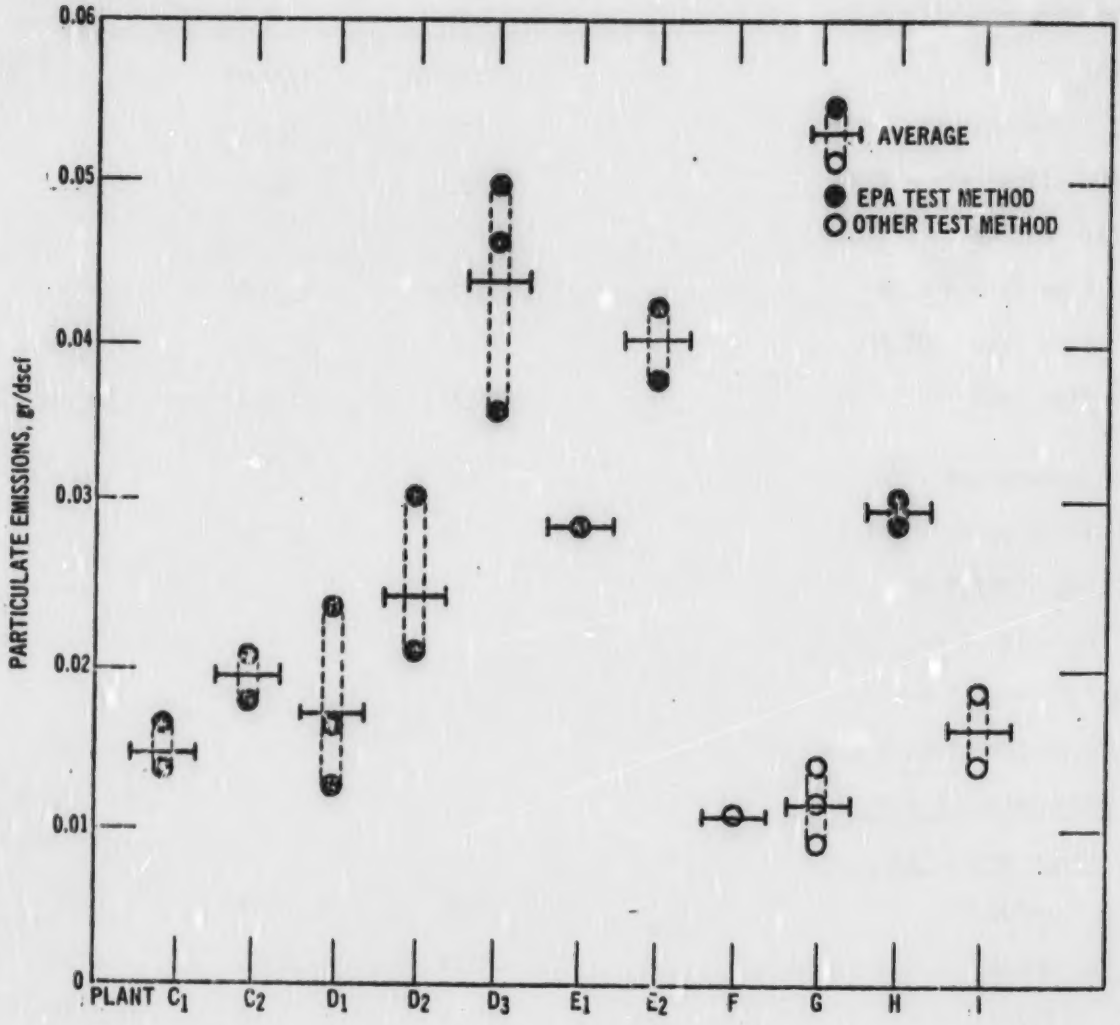

Figure 2. Particulate emissions from thermal dryer exhausts controlled by wet scrubbers.

Table 1
FACILITY A
Summary of Results

Run Number	1	2	Average
Date	1/20/72	1/21/72	
Test Time-minutes	120	120	
Production rate - TPH	70.3	70.3	70.3
Stack Effluent			
Flow rate - ACFM	33,700	33,000	33,350
Flow rate - DSCFM	33,000	35,500	34,250
Flow rate - DSCF/ton	28,718	30,343	29,531
Temperature - ^{o}F	56	30	46
Water vapor - Vol.%	1.42	0.97	1.00
CO_2 - Vol.% dry	-	-	-
O_2 - Vol.% dry	-	-	-
CO - Vol. % dry	-	-	-
Visible Emissions % opacity	0	0	0
Particulate Emissions			
Probe and filter catch			
gr/DSCF	.0100	.0052	.0081
gr/ACF	.0100	.0056	.0083
lb/hr	3.14	1.58	2.36
lb/ton of product	0.045	0.022	0.034
Total catch			
gr/DSCF	.0142	.0120	.0130
gr/ACF	.0142	.0130	.0141
lb/hr	4.00	3.92	4.00
lb/ton of product	0.058	0.056	0.057

Reference 1.

Table 2

FACILITY B_1

Summary of Results

Run Number	1	2	3	Average
Date	2/23/72	2/24/72	2/24/72	
Test Time-minutes	120	120	120	120
Production rate - TPH	38	38	38	38
Stack Effluent				
Flow rate - ACFM	27,318	25,468	26,607	26,464
Flow rate - DSCFM	25,918	23,902	24,002	24,007
Flow rate - DSCF/ton	40,923	40,213	41,786	40,974
Temperature - ^{o}F	63	65	65	64
Water vapor - Vol.%	0.886	0.988	1.072	0.982
CO_2 - Vol.% dry	-	-	-	-
O_2 - Vol.% dry	-	-	-	-
CO - Vol. % dry	-	-	-	-
Visible Emissions % opacity	0	0	0	0
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.011	0.002	0.003	0.005
gr/ACF	0.010	0.002	0.003	0.005
lb/hr	2.41	0.36	0.57	1.11
lb/ton of product	0.063	0.010	0.015	0.029
Total catch				
gr/DSCF	0.015	0.012	0.007	0.011
gr/ACF	0.014	0.012	0.007	0.011
lb/hr	3.35	2.54	1.56	2.48
lb/ton of product	0.088	0.067	0.041	0.065

Reference 2.

Table 3

FACILITY B_2

Summary of Results

Run Number	1	2	3	4
Date	5/12/70	5/12/70	5/13/70	5/13/70
Test Time-minutes	60	60	60	60
Production rate - TPH	--	--	--	--
Stack Effluent				
Flow rate - ACFM	--	--	--	--
Flow rate - DSCFM	--	--	--	--
Flow rate - DSCF/ton	--	--	--	--
Temperature - ^{o}F	--	--	--	--
Water vapor - Vol.%	--	--	--	--
CO_2 - Vol.% dry	--	--	--	--
O_2 - Vol.% dry	--	--	--	--
CO - Vol. % dry	--	--	--	--
Visible Emissions % opacity	--	--	--	--
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.006	0.008	0.008	0.006
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--
Total catch				
gr/DSCF	--	--	--	--
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--

Table 3 (continued)

FACILITY B_2

Summary of Results

Run Number	5	6	7	8
Date	5/13/70	5/14/70	5/14/70	5/14/70
Test Time-minutes	60	60	60	60
Production rate - TPH	--	--	--	--
Stack Effluent				
Flow rate - ACFM	--	--	--	--
Flow rate - DSCFM	--	--	--	--
Flow rate - DSCF/ton	--	--	--	--
Temperature - ^oF	--	--	--	--
Water vapor - Vol.%	--	--	--	--
CO_2 - Vol.% dry	--	--	--	--
O_2 - Vol.% dry	--	--	--	--
CO - Vol. % dry	--	--	--	--
Visible Emissions % opacity	--	--	--	--
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.005	0.004	0.011	0.009
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--
Total catch				
gr/DSCF	--	--	--	--
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--

Table 3 (continued)

FACILITY B_2

Summary of Results

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Run Number	9	10	Average
Date	5/15/70	5/15/70	--
Test Time-minutes	60	60	60
Production rate - TPH	--	--	--
Stack Effluent			
Flow rate - ACFM	--	--	--
Flow rate - DSCFM	--	--	--
Flow rate - DSCF/ton	--	--	--
Temperature - ^{o}F	--	--	--
Water vapor - Vol.%	--	--	--
CO_2 - Vol.% dry	--	--	--
O_2 - Vol.% dry	--	--	--
CO - Vol. % dry	--	--	--
Visible Emissions % opacity	--	--	--
Particulate Emissions			
Probe and filter catch			
gr/DSCF	0.005	0.007	0.007
gr/ACF	--	--	--
lb/hr	--	--	--
lb/ton of product	--	--	--
Total catch			
gr/DSCF	--	--	--
gr/ACF	--	--	--
lb/hr	--	--	--
lb/ton of product	--	--	--

Reference 3.

Table 4

FACILITY C_1

Summary of Results

Run Number	1	2	3	Average
Date	2/29/72	3/1/72	3/2/72	-
Test Time-minutes	120	120	120	120
Production rate - TPH	300	300	300	300
Stack Effluent				
Flow rate - ACFM	145,072	145,287	151,456	147,272
Flow rate - DSCFM	106,330	107,530	111,560	108,473
Flow rate - DSCF/ton dryer capacity	21,266	21,506	22,312	21,695
Temperature - ^{o}F	125	125	125	125
Water vapor - Vol.%	14.37	12.98	12.74	13.36
CO_2 - Vol.% dry	1.0	0.7	0.1	0.6
O_2 - Vol.% dry	19.2	19.7	20.6	19.8
CO - Vol. % dry	-	-	-	-
Visible Emissions % opacity	10	10	10	10
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.017	0.013	0.013	0.014
gr/ACF	0.012	0.010	0.010	0.011
lb/hr	15.16	12.39	13.83	13.43
lb/ton of product	0.051	0.041	0.046	0.0
Total catch				
gr/DSCF	0.021	0.016	0.015	0.017
gr/ACF	0.015	0.012	0.011	0.013
lb/hr	18.77	14.55	14.81	16.04
lb/ton of product	0.063	0.049	0.049	0.053

Reference 4.

Table 5

FACILITY C_2

Summary of Results

Run Number	1	2	3	Average
Date	10/24/72	10/25/72	10/26/72	-
Test Time-minutes	120	120	120	120
Production rate - TPH	300	300	280	293
Stack Effluent				
Flow rate - ACFM	157,812	154,103	149,481	153,025
Flow rate - DSCFM	114,589	113,853	109,405	112,616
Flow rate - DSCF/ton capacity	22,918	22,771	21,881	21,523
Temperature - ^{o}F	126	123	126	125
Water vapor - Vol.%	14.14	12.41	13.58	13.71
CO_2 - Vol.% dry	-	-	-	-
O_2 - Vol.% dry	-	-	-	-
CO - Vol. % dry	-	-	-	-
Visible Emissions % opacity	<10	<10	<10	<10
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.016	0.021	0.021	0.019
gr/ACF	0.011	0.015	0.016	0.014
lb/hr	15.25	20.17	20.10	18.51
lb/ton of product	0.051	0.067	0.072	0.063
Total catch				
gr/DSCF	0.017	0.022	0.025	0.021
gr/ACF	0.012	0.016	0.018	0.015
lb/hr	16.48	21.20	23.17	20.28
lb/ton of product	0.055	0.071	0.083	0.069

Reference 5.

Table 6

FACILITY D_1

Summary of Results

Run Number	1	2	3	Average
Date	1/25/72	1/26/72	1/27/72	-
Test Time-minutes	120	120	120	120
Production rate - TPH	360	360	360	360
Stack Effluent				
Flow rate - ACFM*	215,722	210,151	208,062	211,312
Flow rate - DSCFM*	162,000	157,000	157,000	158,667
Flow rate - DSCF/ton* dryer capacity	27,000	26,167	26,167	26,445
Temperature - ^{o}F	53	69	65	62
Water vapor - Vol.%	13.3	13.4	12.7	13.1
CO_2 - Vol.% dry	1.1	1.6	1.5	1.4
O_2 - Vol.% dry	17.4	17.7	17.7	17.6
CO - Vol. % dry	-	-	-	-
Visible Emissions % opacity	<10	<10	<10	<10
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.0236	0.0118	0.0159	0.0171
gr/ACF	0.0177	0.0088	0.0120	0.0128
lb/hr*	32.8	15.9	21.4	23.4
lb/ton of product*	0.091	0.044	0.060	0.065
Total catch				
gr/DSCF	0.0305	0.0157	0.0208	0.0223
gr/ACF	0.0229	0.0117	0.0157	0.0168
lb/hr*	42.3	21.1	28.0	30.5
lb/ton of product	0.118	0.059	0.078	0.085

* High results due to inaccuracy of pitot readings in swirling gas flow. Actual values are approximately 0.7 times the values shown in the table.

Reference 6.

Table 7

FACILITY D2

Summary of Results

Run Number	1	2	3	Average
Date	9/12/72	9/13/72	9/20/72	-
Test Time-minutes	120	120	120	120
Production rate - TPH	344	306	306	319
Stack Effluent				
Flow rate - ACFM *	215,138	216,563	225,451	219,051
Flow rate - DSCFM *	165,033	164,013	169,055	166,034
Flow rate - DSCF/ton * dryer capacity	28,786	31,767	33,148	31,227
Temperature - ^{o}F	119	125	125	123
Water vapor - Vol.%	13.41	13.16	14.59	13.72
CO_2 - Vol.% dry	-	-	-	-
O_2 - Vol.% dry	-	-	-	-
CO - Vol. % dry	-	-	-	-
Visible Emissions % opacity	<10	<10	<10	<10
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.0196	0.0211	0.0308	0.0238
gr/ACF	0.0150	0.0160	0.0232	0.0197
lb/hr *	27.75	29.66	44.58	34.00
lb/ton of product *	0.081	0.097	0.145	0.107
Total catch				
gr/DSCF	0.0377	0.0253	0.0369	0.0333
gr/ACF	0.0289	0.0192	0.0277	0.0253
lb/hr *	53.32	35.56	53.46	47.48
lb/ton of product *	0.155	0.116	0.175	0.149

* High results due to inaccuracy of pitot readings in swirling gas flow. Actual values are approximately 0.7 times the values shown in the table.

Reference 7.

Table 8

FACILITY D_3

Summary of Results

Run Number	1	2	3	Average
Date	9/20/72	9/20/72	9/21/72	-
Test Time-minutes	120	120	120	120
Production rate - TPH	306	335	306	316
Stack Effluent				
Flow rate - ACFM	177,649	175,139	176,764	176,517
Flow rate - DSCFM	127,433	127,723	129,700	128,050
Flow rate - DSCF/ton capacity	24,987	22,808	25,443	24,413
Temperature - ^{o}F	126	124	123	124
Water vapor - Vol.%	14.59	13.98	13.36	13.98
CO_2 - Vol.% dry	-	-	-	-
O_2 - Vol.% dry	-	-	-	-
CO - Vol. % dry	-	-	-	-
Visible Emissions % opacity	<10	<10	<10	<10
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.0461	0.0498	0.0350	.0402
gr/ACF	0.0344	0.0372	0.0266	0.0327
lb/hr	50.35	54.51	38.92	47.93
lb/ton of product	0.165	0.162	0.127	0.151
Total catch				
gr/DSCF	0.0531	0.0590	0.0417	0.0513
gr/ACF	0.0396	0.0445	0.0317	0.0389
lb/hr	58.00	64.58	46.37	56.32
lb/ton of product	0.184	0.192	0.152	0.176

Reference 7.

Table 9

FACILITY D_4

SUMMARY OF VISIBLE EMISSIONS

Date: 2/5/74

Type of Plant: Coal Preparation

Type of Discharge: Vertical Stack

Location of Discharge: Clean Coal Transfer Point

Height of Point of Discharge: 60 ft.

Distance from Observer to Discharge Point: 150 ft.

Height of Observation Point: Ground Level

Direction of Observer from Discharge Point: North

Description of Background: Brown Hillside

Description of Sky: Scattered Clouds (40% cover)

Wind Direction: Calm

Wind Velocity: Calm mi/hr

Color of Plume: Lt. grey when visible

Detached Plume: No

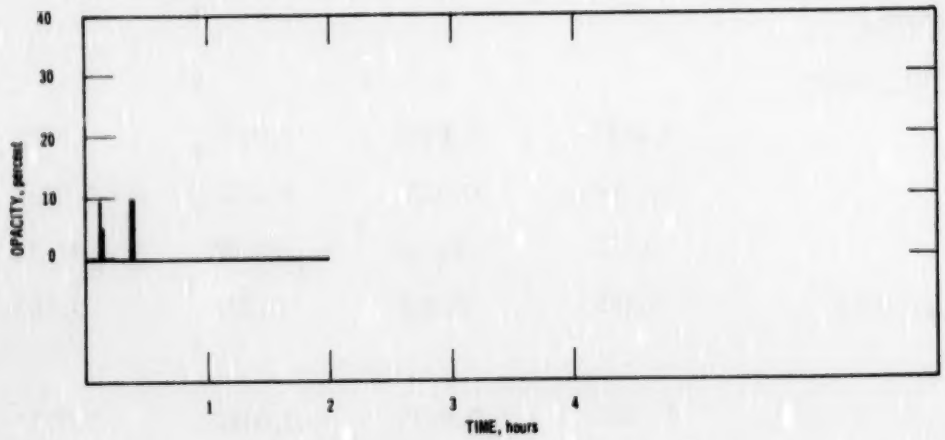
Interference of Steam Plume: Occasional

Duration of Observation: 2 hours

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	8	0	55	-	-
10	4	15	60	-	-
15	-	-	65	-	-
20	-	-	70	-	-
25	-	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Opacity Variation with Time:



Reference 8.

Table 10

FACILITY D_4

SUMMARY OF VISIBLE EMISSIONS

Date: 2/5/74

Type of Plant: Coal Preparation

Type of Discharge: Vertical Stack

Location of Discharge: Load-out (Rotoclone)

Height of Point of Discharge: 80 ft.

Description of Background: Brown Hillside

Distance from Observer to Discharge Point: 300 ft.

Height of Observation Point: Ground Level

Direction of Observer from Discharge Point: North

Description of Sky: Partly Cloudy (50% cover)

Wind Direction: Calm

Wind Velocity: Calm mi/hr

Color of Plume: Lt. grey when visible

Detached Plume: No

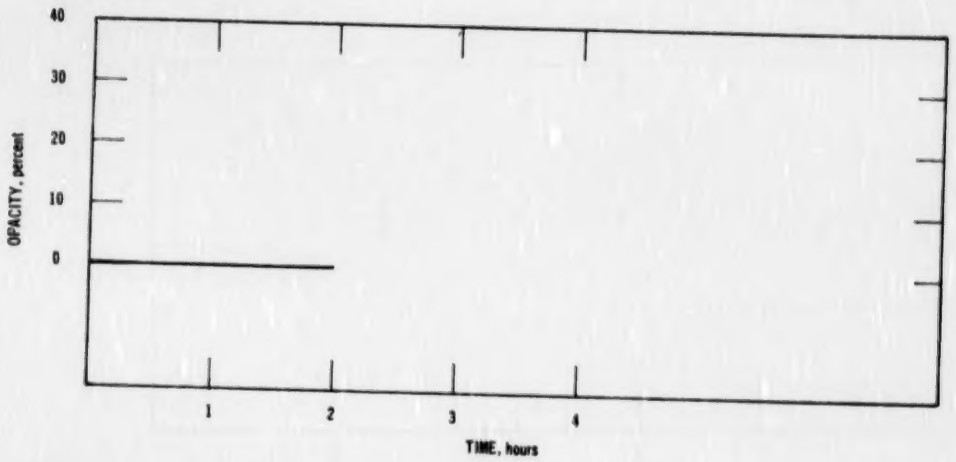
Interference of Steam Plume: Occasional

Duration of Observation: 2 hours

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	0	0	55	-	-
10	-	-	60	-	-
15	-	-	65	-	-
20	-	-	70	-	-
25	-	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Opacity Variation with Time:



Reference 8.

Table 11

FACILITY D_4

SUMMARY OF VISIBLE EMISSIONS

Date: 2/7/74

Type of Plant: Coal Preparation

Type of Discharge: Horizontal Stack

Location of Discharge: Breaker-Baghouse Exhaust

Height of Point of Discharge: 35 ft.

Distance from Observer to Discharge Point: 100 ft.

Height of Observation Point: Ground Level

Direction of Observer from Discharge Point: East

Description of Background: Side of plant; gray metal background.

Description of Sky: Cloudy

Wind Direction: Northwest

Wind Velocity: ~15 mi/hr

Color of Plume: None

Detached Plume: No

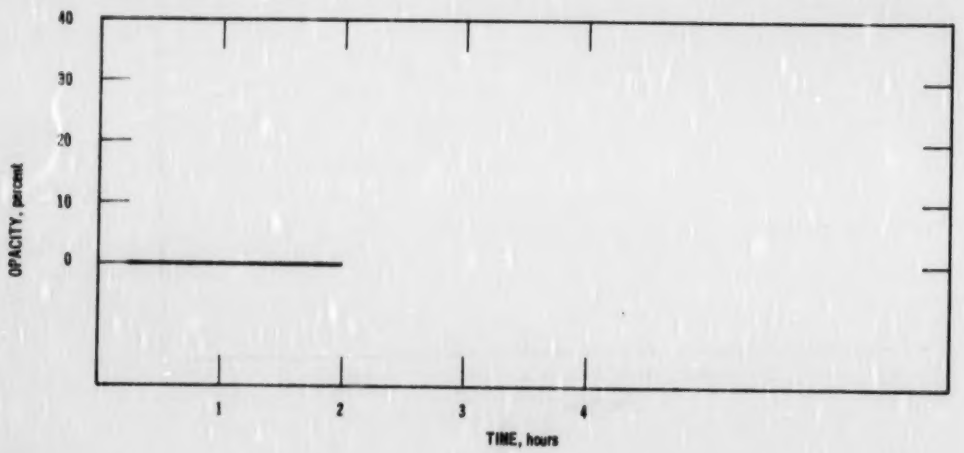
Interference of Steam Plume: None

Duration of Observation: 2 hours

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	0	0	55	-	-
10	-	-	60	-	-
15	-	-	65	-	-
20	-	-	70	-	-
25	-	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Opacity Variation with Time:



Reference 8.

Table 12
FACILITY D_4
SUMMARY OF VISIBLE EMISSIONS

Date: 2/5/74
Type of Plant: Coal Preparation
Type of Discharge: Vertical Stack
Location of Discharge: Thermal Dryer-Scrubber Outlet
Height of Point of Discharge: ~120 ft.
Description of Background: Sky

Distance from Observer to Discharge Point: 300 ft.
Height of Observation Point: Ground Level
Direction of Observer from Discharge Point: Northeast

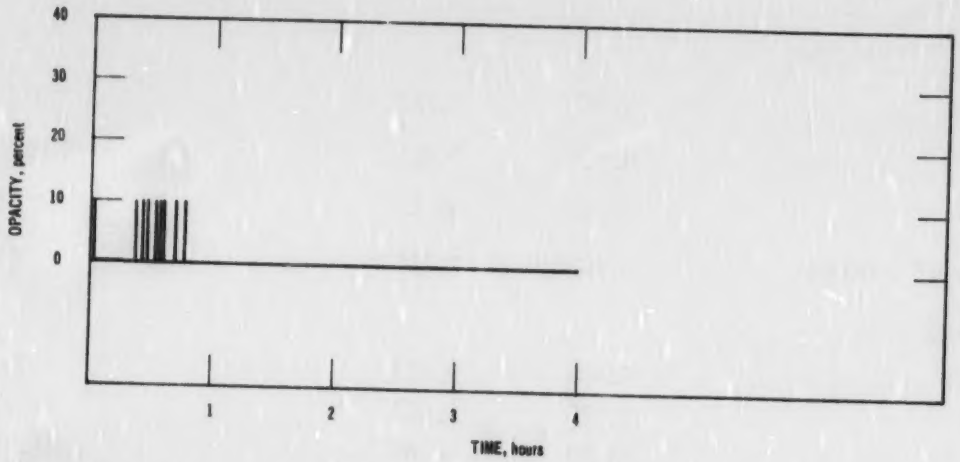
Description of Sky: Clear.

Wind Direction: Calm
Wind Velocity: Calm mi/hr
Color of Plume: Lt. Grey when visible
Detached Plume: No
Interference of Steam Plume: Total at stack; partial up to 500 ft. elevation
Duration of Observation: 4 hours

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	12	0	55	-	-
10	12	0	60	-	-
15	-	-	65	-	-
20	-	-	70	-	-
25	-	-	75	-	-
30	-	-	80	-	-
35	-	-	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Opacity Variation with Time:



Reference 8.

Table 13

FACILITY [illegible]

Summary of Results

Run Number	1	2	Average
Date	3/23/72	3/23/72	-
Test Time-minutes	120	120	120
Production rate - TPH	200	200	200
Stack Effluent			
Flow rate - ACFM*	133,198	178,924	181,061
Flow rate - DSCFM*	135,450	136,070	135,760
Flow rate - DSCF/ton* capacity	40,635	40,821	40,728
Temperature - ^{o}F	120	120	120
Water vapor - Vol.%	11.93	9.37	10.65
CO_2 - Vol.% dry	0.3	0.4	0.35
O_2 - Vol.% dry	19.8	19.8	19.8
CO - Vol. % dry	-	-	-
Visible Emissions % opacity	<10	<10	<10
Particulate Emissions			
Probe and filter catch			
gr/DSCF	0.027	0.028	0.0275
gr/ACF	0.020	0.021	0.0205
lb/hr*	31.57	32.88	32.23
lb/ton of product*	0.158	0.164	0.161
Total catch			
gr/DSCF	0.035	0.037	0.036
gr/ACF	0.026	0.028	0.027
lb/hr *	41.09	42.80	41.95
lb/ton of product *	0.205	0.214	0.210

* High results due to inaccuracy of pitot readings in swirling gas flow. Actual values are approximately 0.7 times the values shown in the table.
Reference 9.

Table 14

FACILITY E_2

Summary of Results

Reproduced from best available copy.

Run Number	1(a)	2	3	Average (b)
Date	3/20/72	3/22/72	3/22/72	-
Test Time-minutes	120	120	120	120
Production rate - TPH	200	200	200	200
Stack Effluent				
Flow rate - ACFM *	184,893	177,611	171,537	174,574
Flow rate - DSCFM*	137,310	128,520	127,100	127,810
Flow rate - DSCF/ton * capacity	41,193	38,556	38,130	38,343
Temperature - ^{o}F	200	200	200	200
Water vapor - Vol.%	12.61	13.51	12.56	13.04
CO_2 - Vol.% dry	0.2	0.3	0.2	0.25
O_2 - Vol.% dry	18.2	19.6	19.4	19.5
CO - Vol. % dry	-	-	-	-
Visible Emissions % opacity	15+	10	10	10
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.046	0.037	0.043	0.040
gr/ACF	0.034	0.027	0.032	0.030
lb/hr*	53.54	40.31	47.16	43.73
lb/ton of product *	0.267	0.202	0.236	0.219
Total catch				
gr/DSCF	0.050	0.050	0.056	0.053
gr/ACF	0.044	0.036	0.041	0.040
lb/hr*	68.90	54.74	61.22	57.98
lb/ton of product *	0.345	0.274	0.306	0.290

* High results due to inaccuracy of pitot readings in swirling gas flow. Actual values are approximately 0.7 times the values shown in the table.

(a) Process unstable

(b) Average for run 2 and 3

Reference 9

Table 15

FACILITY F

Summary of Results

Reproduced from best available copy.

Run Number	Average*
Date	1/5/71
Test Time-minutes	--
Production rate - TPH	--
Stack Effluent	
Flow rate - ACFM	141,000
Flow rate - DSCFM	--
Flow rate - DSCF/ton	--
Temperature - ^{o}F	118°F
Water vapor - Vol.%	--
CO_2 - Vol.% dry	--
O_2 - Vol.% dry	--
CO - Vol. % dry	--
Visible Emissions % opacity	--
Particulate Emissions	
Probe and filter catch	
gr/DSCF	0.01
gr/ACF	--
lb/hr	--
lb/ton of product	0.029
Total catch	
gr/DSCF	--
gr/ACF	--
lb/hr	--
lb/ton of product	--

* Individual runs not reported.

Reference 10.

Table 16

FACILITY G

Summary of Results

Run Number	1	2	3	Average
Date	2/11/71	2/11/71	2/11/71	--
Test Time-minutes	66	63	63	64
Production rate - TPH	--	--	--	--
Stack Effluent				
Flow rate - ACFM	--	--	--	--
Flow rate - DSCFM	--	--	--	--
Flow rate - DSCF/ton	--	--	--	--
Temperature - ^{o}F	--	--	--	--
Water vapor - Vol.%	--	--	--	--
CO_2 - Vol.% dry	--	--	--	--
O_2 - Vol.% dry	--	--	--	--
CO - Vol. % dry	--	--	--	--
Visible Emissions % opacity	--	--	--	--
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.011	0.014	0.008	0.011
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--
Total catch				
gr/DSCF	--	--	--	--
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--

Reference 10.

Table 17

FACILITY H

Summary of Results

Reproduced from best available copy.

Run Number	1	2	Average
Date	9/14/71	9/15/71	--
Test Time-minutes	--	--	--
Production rate - TPH	--	--	--
Stack Effluent			
Flow rate - ACFM	70,170	68,604	69,380
Flow rate - DSCFM	--	--	--
Flow rate - DSCF/ton	--	--	--
Temperature - ^{o}F	--	--	--
Water vapor - Vol.%	--	--	--
CO_2 - Vol.% dry	--	--	--
O_2 - Vol.% dry	--	--	--
CO - Vol. % dry	--	--	--
Visible Emissions % opacity	--	--	--
Particulate Emissions			
Probe and filter catch			
gr/DSCF	0.031	.0275	0.029
gr/ACF	--	--	--
lb/hr	--	--	--
lb/ton of product	0.087	0.079	0.083
Total catch			
gr/DSCF	--	--	--
gr/ACF	--	--	--
lb/hr	--	--	--
lb/ton of product	--	--	--

Reference 10.

Table 18

FACILITY I

Summary of Results

Run Number	1	2	3	Average
Date	7/26/72	7/26/72	7/26/72	--
Test Time-minutes	48	48	48	48
Production rate - TPH	--	--	--	--
Stack Effluent				
Flow rate - ACFM	--	--	--	--
Flow rate - DSCFM	--	--	--	--
Flow rate - DSCF/ton	--	--	--	--
Temperature - ^{o}F	114	117	108	113
Water vapor - Vol.%	--	--	--	--
CO_2 - Vol.% dry	--	--	--	--
O_2 - Vol.% dry	--	--	--	--
CO - Vol. % dry	--	--	--	--
Visible Emissions % opacity	--	--	--	--
Particulate Emissions				
Probe and filter catch				
gr/DSCF	0.013	0.019	0.012	0.015
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--
Total catch				
gr/DSCF	--	--	--	--
gr/ACF	--	--	--	--
lb/hr	--	--	--	--
lb/ton of product	--	--	--	--

Reference 10.

Table 19

FACILITY X

SUMMARY OF VISIBLE EMISSIONS

Date: 2/6/74

Type of Plant: Coal Preparation

Type of Discharge: Vertical Stack

Location of Discharge: Clean Coal Transfer Point

Height of Point of Discharge: 60 ft.

Distance from Observer to Discharge Point: 250 ft.

Height of Observation Point: Ground Level

Direction of Observer from Discharge Point: North

Description of Background: Brown Hillside

Description of Sky: Overcast

Wind Direction: Calm

Wind Velocity: Calm mi/hr

Color of Plume: Grey when visible

Detached Plume: No

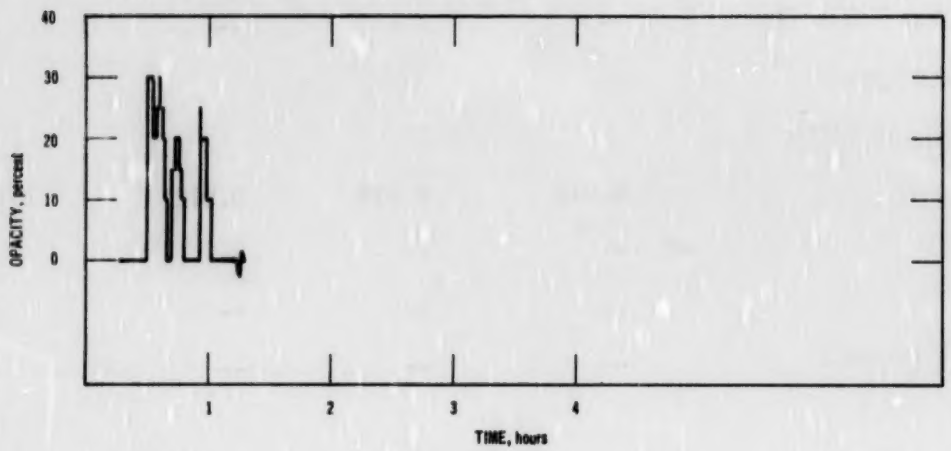
Interference of Steam Plume: Intermittent

Duration of Observation: 1 hour, 14 minutes. Halted due to rain. Start-ups and shutdowns not included; upsets are included.

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	18	0	55	-	-
10	17	30	60	-	-
15	15	0	65	-	-
20	13	14	70	-	-
25	7	0	75	-	-
30	2	45	80	-	-
35	0	30	85	-	-
40	0	0	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Opacity Variations with Time:



Reference 8.

Table 20

FACILITY X

SUMMARY OF VISIBLE EMISSIONS

Date: 2/6/74

Type of Plant: Coal Preparation

Type of Discharge: Vertical Stack

Location of Discharge: Load-out (Rotoclone)

Height of Point of Discharge: 80 ft.

Description of Background: Sky

Distance from Observer to Discharge Point: 400 ft.

Height of Observation Point: Ground Level

Direction of Observer from Discharge Point: North

Description of Sky: Overcast

Wind Direction: Calm

Wind Velocity: Calm mi/hr

Color of Plume: Grey when visible.

Detached Plume: No

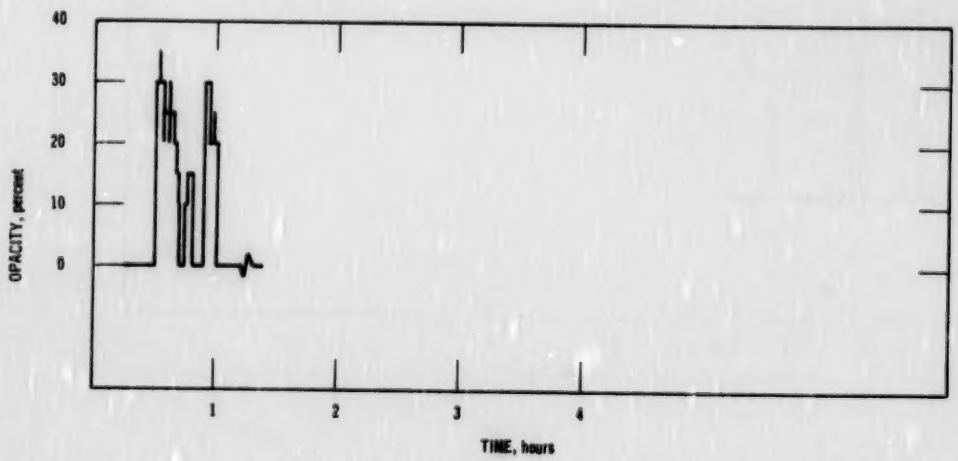
Interference of Steam Plume: Intermittent

Duration of Observation: 1 hour, 13 minutes. Halted due to rain. Start-ups and shutdowns not included; upsets are included.

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	19	30	55	-	-
10	18	45	60	-	-
15	15	0	65	-	-
20	11	30	70	-	-
25	8	0	75	-	-
30	4	0	80	-	-
35	0	15	85	-	-
40	0	0	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Opacity Variations with Time:



Reference 8.

Table 21

FACILITY X

SUMMARY OF VISIBLE EMISSIONS

Date: 2/6/74

Type of Plant: Coal Preparation

Type of Discharge: Vertical Stack | Distance from Observer to Discharge Point: 300 ft.

Location of Discharge: Thermal Dryer-Scrubber Outlet | Height of Observation Point: Ground Level

Height of Point of Discharge: 120 ft. | Direction of Observer from Discharge Point: Northeast

Description of Background: Sky

Description of Sky: Overcase; rain began during observation. Readings terminated when rainfall became heavy.

Wind Direction: Calm | Wind Velocity: Calm mi/hr

Color of Plume: Lt. grey when visible | Detached Plume: No

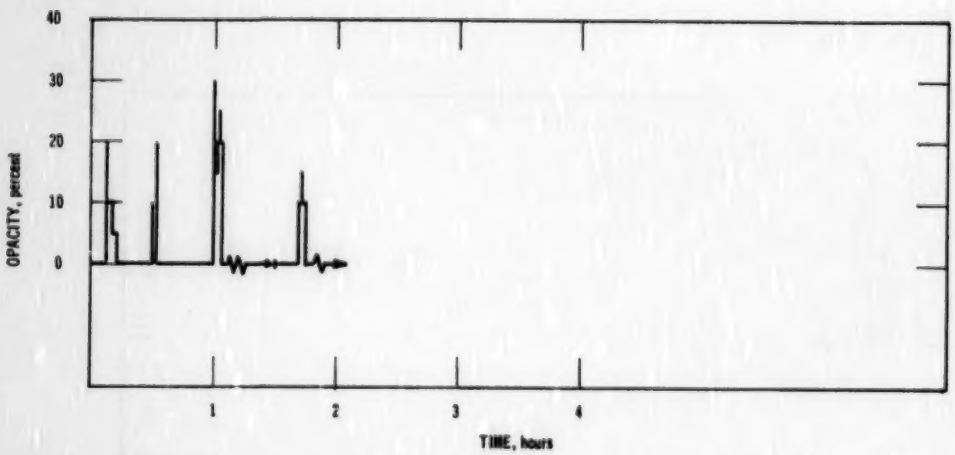
Interference of Steam Plume: Total at stack; partial up to 100-300 ft. above stack.

Duration of Observation: 1 hour, 18 minutes. Dryer upset, then rainfall became heavy before dryer started up again. Readings for start-up and shutdown not included in this summary; upsets are included.

Summary of Data:

Opacity, Percent	Total Time Equal to or Greater Than Given Opacity		Opacity, Percent	Total Time Equal to or Greater Than Given Opacity	
	Min.	Sec.		Min.	Sec.
5	13	15	55	-	-
10	11	45	60	-	-
15	5	15	65	-	-
20	3	15	70	-	-
25	1	15	75	-	-
30	0	30	80	-	-
35	0	0	85	-	-
40	-	-	90	-	-
45	-	-	95	-	-
50	-	-	100	-	-

Opacity Variations with Time:



Reference 8.

REFERENCES

1. "Report by York Research Corporation on Emissions From [Facility A]," prepared for EPA by York Research Corporation, Report No. Y-7730-G, February 18, 1972, EPA Test No. 72-CI-4.

2. "Coal Preparation Plant Emission Tests" For Facility B_1, prepared for EPA by Scott Research Laboratories, Incorporated, Contract No. 68-02-0233, EPA Test No. 72-CI-13.

3. Emission Test Report for Facility B_2, July 21, 1970, submitted by the owner to EPA.

4. "Coal Preparation Plant Emission Tests" for Facility C_1, prepared for EPA by Scott Research Laboratories, Incorporated, Contract No. 68-02-0233, EPA Test No. 72-CI-19.

5. "Coal Preparation Plant Emission Tests" for Facility C_2, prepared for EPA by Scott Research Laboratories, Incorporated, Contract No. 68-02-0233, November 1972, EPA Test No. 72-CI-19(CCL).

6. "Report by York Research Corporation on Emissions From [Facility D_1]," prepared for EPA by York Research Corporation, Report No. Y-7730-H, February 14, 1972, EPA Test No. 72-CI-6.

7. "Coal Preparation Plant Emission Tests" for Facilities D_2 and D_3, prepared for EPA by Scott Research Laboratories, Incorporated, Contract No. 68-02-0233, October 1972, EPA Test No. 73-CCL-2.

8. Sedman, Charles B., "Trip Report--Monitoring of Visible Emissions From Coal Preparation Plants," February 13, 1974.

9. "Coal Preparation Plant Emission Tests" for Facilities E_1 and E_2, prepared for EPA by Scott Research Laboratories, Incorporated, Contract No. 68-02-0233, EPA Test No. 72-CI-22.

10. EPA questionnaire data.